Designation: D6321/D6321M – 14

Standard Practice for the Evaluation of Machine Washable T-Shirts[1]

This standard is issued under the fixed designation D6321/D6321M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice covers test methods and procedures used to evaluate important characteristics of machine washable T-shirts. T-shirts may be made of knitted fabric composed of any textile fiber(s) or blend of fibers and intended to be used as underwear or as an outer garment.

1.2 T-shirts' characteristics may be assessed either as a final product or at any intermediate processing stage.

1.3 This practice excludes T-shirts intended for hand washing or dry cleaning care.

1.4 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standards to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D123 Terminology Relating to Textiles
D1776 Practice for Conditioning and Testing Textiles
D3786 Test Method for Bursting Strength of Textile Fabrics—Diaphragm Bursting Strength Tester Method
D3787 Test Method for Bursting Strength of Textiles—Constant-Rate-of-Traverse (CRT) Ball Burst Test
D3887 Specification for Tolerances for Knitted Fabrics
D3940 Test Method for Bursting Strength (Load) and Elongation of Sewn Seams of Knit or Woven Stretch Textile Fabrics (Withdrawn 1995)[3]
D4154 Performance Specification for Men's and Boys' Knitted and Woven Beachwear and Sports Shirt Fabrics
D4156 Performance Specification for Women's and Girls' Knitted Sportswear Fabrics
D7022 Terminology Relating to Apparel

2.2 *AATCC Test Methods:*[4]

Evaluation Procedure 1, Gray Scale for Color Change
Evaluation Procedure 2, Gray Scale for Staining
Evaluation Procedure 7, Instrumental Assessment of the Change in Color of a Textile Specimen
Method 107, Colorfastness to Water
Method 150, Dimensional Changes of Garments after Home Laundering
Method 172, Colorfastness to Powered Non-Chlorine Bleach in Home Laundering
Method 179, Skewness Change in Fabric and Garment Twist Resulting from Automatic Home Laundering

2.3 *Other Documents:*

A Glossary of AATCC Standard Terminology[4]
Standardization of Home Laundry Test Conditions[4]

3. Terminology

3.1 For all terminology relating to D13.61, Apparel, refer to Terminology D7022.

3.1.1 The following terms are relevant to this standard: T-shirt.

3.1.2 For definitions of other textile terms used in this standard, refer to terminology in Terminology D123 and Glossary of AATCC Standard Terminology.

4. Significance and Use

4.1 This practice may be used to evaluate pertinent characteristics of washable T-shirts.

4.2 T-shirts may be subject to extra processes such as garment dyeing, garment washing, printing, application of embroidery or trims. An individual process or combination or processes may affect the performance of the final product.

[1] This practice is under the jurisdiction of ASTM Committee D13 on Textiles, and is the direct responsibility of Subcommittee D13.61 on Apparel.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] The last approved version of this historical standard is referenced on www.astm.org.

[4] Available from AATCC, PO Box 12215, Research Triangle Park, NC 27709.

4.3 This practice may be used by mutual agreement between the purchaser and the supplier to establish purchasing specifications.

5. Sampling, Selection, and Number of Specimens

5.1 *Lot Sample*—Take a lot sample as directed in an applicable material specification or as agreed between purchaser and supplier, such as an agreement to take at random some fixed number of shipping containers or garments from each lot.

5.2 *Laboratory Sample*—From each lot sampling unit, take five T-shirts to be used as the laboratory sample.

5.3 *Test Specimen*—From each laboratory sample, two T-shirts are to be tested as-received and two T-shirts that are to be laundered. The fifth T-shirt is to be retained as a control specimen and not tested.

6. Fabric Performance Characteristics

6.1 Evaluate fabric designated for T-shirt manufacture using Specification D3887, D3787, Performance Specification D4154, or Performance Specification D4156 as appropriate.

7. Garment Performance Characteristics

7.1 *Assessments Prior to Machine Laundering (As-Received State):*

7.1.1 Condition T-shirts in standard atmospheres for testing 20 ± 3°C [70 ± 2°F] and 65 ± 2 % RH according to Practice D1776 for 4 hrs.

7.1.2 *Shade Difference*—Examine each of the four T-shirts for shade difference, garment panel-to-panel, using AATCC Evaluation Procedure 1 or 7.

NOTE 1—Difference results may be obtained when using the subjecting assessment in AATCC Evaluation Procedure 1 when using the instrumental assessment in AATCC Evaluation Procedure 7.

7.1.3 *Defects*—Examine the four T-shirts for needle cutting, seam appearance, surface irregularities, or any other defect and record the information.

7.1.4 *Seam Performance*—Determine seam performance for the two as-received T-shirts as directed in Test Method D3940.

7.1.5 *Bursting Force*—If the fabric is not available for 6.1, determine bursting strength on the as-received T-shirts using D3787 or D3786.

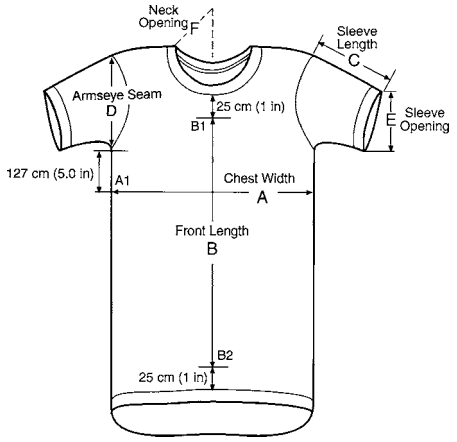
7.2 *Specimen Preparation Prior to Laundering:*

7.2.1 Condition T-shirts to the standard atmospheres of 20 ± 3°C [70 ± 2°F] and 65 % RH as specified in Practice D1776 for at least 4 h.

7.2.2 Lay the two T-shirts designated for laundering on a flat surface without tension, aligning sides and sleeves and smoothing to minimize folds and wrinkles.

7.2.3 Mark the dimensions to be measured with an indelible marking pen.

7.2.3.1 For garment dimensional change, mark the locations according to AATCC TM 150 and as shown in Fig. 1 using a plastic or metal tape graduated in increments of millimetres [1⁄16 in.]:



NOTE 1—Refer to AATCC Test Method 150.

FIG. 1 Dimensional Change Marking Location

7.2.3.2 *Chest Width*—Place marks "A1" and "A2" 125 mm [5.0 in] below each armhole seam. This is Distance "A". Measure and record the distance across the chest to the nearest mm [1⁄16 in.].

7.2.3.3 *Front Length*—Fold the T-shirts in half lengthwise, back-to-back, matching shoulder and neck band seams. Lay the folded T-shirts flat on a smooth surface. Place marks "B1" and "B2" 25 mm [1 in.] below the center neck band and 25 mm [1 in.] above the bottom hem. This is Distance "B". Measure and record the distance between the upper and lower marks to the nearest mm [1⁄16 in.].

7.2.3.4 *Sleeve Length*—Place two T-shirts flat on a smooth surface. Mark the distance between the upper shoulder joining to the lower edge of the sleeve hem. This is Distance "C". Measure and record the distance between the marked shoulder seam and the hem edge to the measure mm [1⁄16].

7.2.3.5 *Sleeve Seam*—Place T-shirts flat on a smooth surface. Measure and record the distance between the upper shoulder joining and the underarm seam intersection to the nearest mm [1⁄16 in.]. This measurement is Distance "D".

7.2.3.6 *Sleeve Opening*—Place T-shirts flat with the sleeves folded. Measure and record the distance between the upper edge of the sleeve hem to the lower edge of the sleeve on the outer edge to the nearest mm [1⁄16 in.]. This is Distance "E". The measured distance should be doubled and recorded.

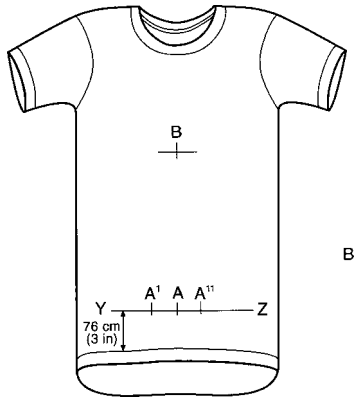
7.2.3.7 *Neck Opening*—Grasp the neck band at the center back and the center front, forming a folded edge. Measure across the folded band. This is Distance "F". The measured distance should be doubled and recorded.

7.2.4 *Skewness Change*—Mark the T-shirts according to AATCC Test Method 179, marking Option 3. See Fig. 2.

7.2.5 *Colorfastness to Water*—For dyed or printed T-shirts, prepare specimens for colorfastness to water according to AATCC Test Method 107.

NOTE 2—It has been reported that the results for staining, obtained by standard AATCC Test Methods, on fabrics dyed to dark shades that contain a combination of polyester and spandex, or their blends, may not show the full staining propensity of such fabrics in consumer use. It is, therefore, recommended that the staining results obtained by these tests not be used for acceptance testing of such fabrics.

7.3 *Laundering Conditions:*



Refer to AATCC Test Method, 179 Marking, Option 2: AB = Before Laundering and A'B or A"B = After laundering.

FIG. 2 T-Shirt Skewness Change, Marking Locations

7.3.1 Wash and dry the two T-shirts designated for laundering using the information on the care label and the applicable procedure in AATCC Test Method 150. Use washing and drying conditions that conform to those given in the AATCC monograph (see 2.3).

7.3.2 If colorfastness to non-chlorine bleach is specified on the care label, use AATCC Test Method 172. For chlorine bleach colorfastness, follow bleach manufacturer's recommendations for volume of use and the sequence of addition and the care label instructions on the T-shirt or requirements agreed upon between the purchaser and supplier.

7.4 *Assessment after Machine Laundering:*

7.4.1 *Dimensional Change*—Measure the dimensional change distances after laundering and calculate percent dimensional change as directed in AATCC Test Method 150.

7.4.2 *Skewness Change*—Measure the marked distances after laundering and calculate percent skewness change according to the AATCC Test Method 179, Option 3.

7.4.3 *Staining*—Grade staining of a dyed or printed T-shirts by using AATCC Test Method 107 and Evaluation Procedure 2. If multifiber or crock square swatches were sewn on the T-shirts before laundering, evaluate the staining performance using AATCC Evaluation Procedure 2.

7.4.4 *Shade Difference*—Determine shade differences. Rate change of color on dyed or printed T-shirts from panel to panel and against the original T-shirt. Rate staining using AATCC Evaluation Procedure 2.

7.4.5 *Defects*—Examine T-shirts for defect agreed upon by the purchaser and the supplier.

7.4.6 *Seam Performance*—Assess seam failure as directed in Test Method D3940.

8. Report

8.1 State that the specimens were tested as directed in Practice D6321. Describe the identification of the T-shirt material and the method of sampling used.

8.2 Report the following information:

8.2.1 The number of T-shirts tested, and

8.2.2 The performance characteristics assessed and the results of each.

9. Conformance

9.1 When the purchaser and supplier have agreed upon specific requirements for the characteristics assessed, the T-shirts that fail to meet the requirements may be rejected.

10. Keywords

10.1 T-shirts